IN THE CLAIMS

Please amend claims 1, 6-7, 10, 12, 14-16, 21-23, 25-27, and 29 as indicated below.

1. (Currently Amended) A method, comprising:

~~receiving a speech data stream;~~

performing a Mel Frequency Cepstral Coefficients (MFCC) feature extraction on ~~the~~ a speech data stream;

optimizing feature space transformation (FST);

optimizing model space transformation (MST) based on the FST; and

performing recognition decoding based on the FST and the MST, generating a word sequence,

wherein the FST and MST are optimized jointly via an objective function, wherein an output of the objective function is determined based on the MST and a diagonal covariance matrix based on a product of the MST, FST, and an approximate full covariance matrix of the MST, such that when the MST and FST are optimized, the output of the objective function reaches a maximum value.

2. (Original) The method of claim 1, wherein the optimization of the FST is performed through a linear discriminant analysis (LDA), based on an initial MST.

3. (Original) The method of claim 1, wherein the optimization of the MST is performed through a full covariance transformation (FCT).

4. (Original) The method of claim 1, wherein the optimizations of the FST and the MST are performed jointly and simultaneously.

5. (Original) The method of claim 1, wherein the optimizations of the FST and the MST are performed through an objective function with respect to the FST and the MST, such that the objective function reaches a predetermined state.

6. (Currently Amended) The method of claim 5, A method, comprising:

performing a Mel Frequency Cepstral Coefficients (MFCC) feature extraction on a speech data stream;

optimizing feature space transformation (FST);

optimizing model space transformation (MST) based on the FST; and

performing recognition decoding based on the FST and the MST to generate a word sequence,

wherein the optimizations of the FST and the MST are performed through an objective function with respect to the FST and the MST, such that the objective function reaches a predetermined state, wherein the objective function comprises:

$$Q(M,M) = \sum_{m \in M^{(r)},t} \gamma_m(t)\left(2\log\left(\left|H^{(r)}\right|\right) - \log\left(\left|diag\left(H^{(r)} A W^{(m)} A^T H^{(r)\mathrm{T}}\right)\right|\right)\right) + \beta \log\left|ABA^T\right|$$

wherein H represents a model space transformation, wherein A represents a feature space transformation, and wherein W represents an approximate full covariance matrix.

7. (Currently Amended) The method of claim 1, further comprising:

examining the word sequence to determine if the word sequence is satisfied; and

repeating optimization of FST based on the previously optimized MST ~~MFT~~, and repeating optimization of MST based on the newly optimized FST, if the word sequence is not satisfied.

8. (Original) The method of claim 2, wherein the optimization of the FST is performed through an eigenvalue analysis of a matrix.

9. (Original) The method of claim 8, wherein the matrix comprises a matrix of $W^{-1}B$, wherein the W is the average within-class scatter matrix and the B is the between-class scatter matrix.

10. (Currently Amended) The method of claim 2, wherein the optimization of the FST is performed through an optimization of an objective function, the objective function comprising:

$$A^{*} = \arg\max_{A}\left\{-\frac{N}{2}\log\left|diag\left(A_{n-p}TA_{n-p}^{T}\right)\right| - \sum_{j=1}^{J}\frac{N_j}{2}\log\left|diag\left(A_p W_j A_p^{T}\right)\right| + N\log\left|A\right|\right\}$$

wherein A_{n-p} represents a matrix whose columns are ordered n-p eigenvectors, wherein A_p represents a matix whose columns are the first p eigenvectors, and wherein W represents a within-class scatter matrix.

11. (Original) The method of claim 3, wherein the optimization of the MST is performed through an iterative optimization of a procedure, based on the FST.

12. (Currently Amended) A method, comprising:

providing a first transformation matrix;

providing a second transformation matrix;

optimizing the first transformation matrix and the second transformation matrix jointly and substantially simultaneously; and

generating an output based on the first and second optimized matrixes,

wherein the first and second transformation matrixes are optimized jointly via an objective function, wherein an output of the objective function is determined based on the second transformation matrix and a diagonal covariance matrix based on a product of the second transformation matrix, the first transformation matrix, and an approximate full covariance matrix of the second transformation matrix, such that when the first and second transformation matrixes are optimized, the output of the objective function reaches a maximum value.

13. (Original) The method of claim 12, further comprising providing an objective function with respect to the first transformation matrix and the second transformation matrix, the first and second transformation matrixes being jointly and simultaneously optimized, such that the objective function reaches a predetermined state.

14. (Currently Amended) ~~The method of claim 13,~~ A method, comprising:

optimizing a first transformation matrix and a second transformation matrix jointly and substantially concurrently, using an objective function with respect to the first and the second transformation matrixes to optimize the first and second transformation matrixes, such that the objective function reaches a predetermined state; and

generating an output based on the first and second optimized matrixes, wherein the objective function comprises:

$$Q(M,M) = \sum_{m \in M^{(r)},t} \gamma_m(t)\left(2\log\left(\left|H^{(r)}\right|\right) - \log\left(\left|diag\left(H^{(r)} A W^{(m)} A^T H^{(r)T}\right)\right|\right)\right) + \beta \log\left|ABA^T\right|$$

wherein H represents a model space transformation, wherein A represents a feature space transformation, and wherein W represents an approximate full covariance matrix.

15. (Currently Amended) The method of claim 12, further comprising:

examining the output to determine if the output is satisfied; and

repeating the optimization of the first transformation matrix and the second transformation matrix jointly ~~FST and MST~~, if the output is not satisfied.

16. (Currently Amended) A machine readable medium having stored thereon executable code which causes a machine to perform a method, the method comprising:

receiving a speech data stream;

performing a Mel Frequency Cepstral Coefficients (MFCC) feature extraction on the speech data stream;

optimizing feature space transformation (FST);

optimizing model space transformation (MST); and

performing recognition decoding based on the FST and the MST, generating a word sequence,

wherein the FST and MST are optimized jointly via an objective function, wherein an output of the objective function is determined based on the MST and a diagonal covariance matrix based on a product of the MST, FST, and an approximate full covariance matrix of the MST, such that when the MST and FST are optimized, the output of the objective function reaches a maximum value.

17. (Original) The machine readable medium of claim 16, wherein the optimization of the FST is performed through a linear discriminant analysis (LDA), based on an initial MST.

18. (Original) The machine readable medium of claim 16, wherein the optimization of the MST is performed through a full covariance transformation (FCT).

19. (Original) The machine readable medium of claim 16, wherein the optimizations of the FST and the MST are performed jointly and simultaneously.

20. (Original) The machine readable medium of claim 16, wherein the optimizations of the FST and the MST are performed through an objective function with respect to the FST and the MST, such that the objective function reaches a predetermined state.

21. (Currently Amended) ~~The machine readable medium of claim 20,~~ A machine readable medium having stored thereon executable code which causes a machine to perform a method, the method comprising:

performing a Mel Frequency Cepstral Coefficients (MFCC) feature extraction on a speech data stream;

optimizing feature space transformation (FST);

optimizing model space transformation (MST); and

performing recognition decoding based on the FST and the MST to generate a word sequence,

wherein the optimizations of the FST and the MST are performed through an objective function with respect to the FST and the MST, such that the objective function reaches a predetermined state, wherein the objective function comprises:

$$Q(M,M)=\sum_{m\in M^{(r)},t}\gamma_m(t)\left(2\log\left(\left|H^{(r)}\right|\right)-\log\left(\left|diag\left(H^{(r)}AW^{(m)}A^T H^{(r)T}\right)\right|\right)\right)+\beta\log\left|ABA^T\right|$$

wherein H represents a model space transformation, wherein A represents a feature space transformation, and wherein W represents an approximate full covariance matrix.

22. (Currently Amended) The machine readable medium of claim 16, further comprising:

examining the word sequence to determine if the word sequence is satisfied; and

repeating optimization of FST based on the previously optimized MST ~~MFT~~ and repeating optimization of MST based on the newly optimized FST, if the word sequence is not satisfied.

23. (Currently Amended) A machine readable medium having stored thereon executable code which causes a machine to perform a method, the method comprising:

providing a first transformation matrix;

providing a second transformation matrix;

optimizing the first transformation matrix and the second transformation matrix jointly and simultaneously; and

generating an output based on the first and second optimized matrixes,

wherein the first and second transformation matrixes are optimized jointly via an objective function, wherein an output of the objective function is determined based on the second transformation matrix and a diagonal covariance matrix based on a product of the second transformation matrix, the first transformation matrix, and an approximate full covariance matrix of the second transformation matrix, such that when the first and second transformation matrixes are optimized, the output of the objective function reaches a maximum value.

24. (Original) The machine readable medium of claim 23, wherein the method further comprises providing an objective function with respect to the first transformation matrix and the second transformation matrix, the first and second transformation matrixes being jointly and simultaneously optimized, such that the objective function reaches a predetermined state.

25. (Currently Amended) ~~The machine readable medium of claim 24,~~ A machine readable medium having stored thereon executable code which causes a machine to perform a method, the method comprising:

optimizing a first transformation matrix and a second transformation matrix jointly and substantially concurrently, using an objective function with respect to the first and second transformation matrixes to optimize the first and second transformation matrixes jointly and simultaneously, such that the objective function reaches a predetermined state; and

generating an output based on the first and second optimized matrixes, wherein the objective function comprises:

$$Q(M,M) = \sum_{m \in M^{(r)},t} \gamma_m(t)\left(2\log\left(\left|H^{(r)}\right|\right) - \log\left(\left|diag\left(H^{(r)} A W^{(m)} A^T H^{(r)\mathrm{T}}\right)\right|\right)\right) + \beta \log\left|ABA^T\right|$$

wherein H represents a model space transformation, wherein A represents a feature space transformation, and wherein W represents an approximate full covariance matrix.

26. (Currently Amended) The method of claim 23, further comprising:

examining the output to determine if the output is satisfied; and

repeating the optimization of the first transformation matrix and the second transformation matrix jointly ~~FST and MST~~, if the output is not satisfied.

27. (Currently Amended) A system, comprising:

a first unit to perform a Mel Frequency Cepstral Coefficients (MFCC) feature extraction on a speech data stream;

a second unit to optimize feature space transformation (FST);

a third unit to optimize model space transformation (MST) based on the FST; and

a fourth unit to perform recognition decoding based on the FST and the MST, generating a word sequence,

wherein the FST and MST are optimized jointly via an objective function, wherein an output of the objective function is determined based on the MST and a diagonal covariance matrix based on a product of the MST, FST, and an approximate full covariance matrix of the MST, such that when the MST and FST are optimized, the output of the objective function reaches a maximum value.

28. (Original) The system of claim 27, wherein the optimizations of the FST and the MST are performed jointly and simultaneously.

29. (Currently Amended) A system, comprising:

a first unit to provide a first transformation matrix and a second transformation matrix;

a second unit to optimize the first transformation matrix and the second transformation matrix jointly and substantially simultaneously; and

a third unit to generate an output based on the first and second optimized matrixes,

wherein the first and second transformation matrixes are optimized jointly via an objective function, wherein an output of the objective function is determined based on the second transformation matrix and a diagonal covariance matrix based on a product of the second transformation matrix, the first transformation

matrix, and an approximate full covariance matrix of the second transformation matrix, such that when the first and second transformation matrixes are optimized, the output of the objective function reaches a maximum value.

30. (Original) The system of claim 29, further comprising providing an objective function with respect to the first transformation matrix and the second transformation matrix, the first and second transformation matrixes being jointly and simultaneously optimized, such that the objective function reaches a predetermined state.